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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/807,304

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Toshimitsu Kariya

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EXAMINER

BARTON, JEFFREY THOMAS

ART UNIT

PAPER NUMBER

1795

MAIL DATE

DELIVERY MODE

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PAPER

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

<b>Office Action Summary</b>	<b>Application No.</b> 10/807,304	<b>Applicant(s)</b> KARIYA, TOSHIMITSU	
	<b>Examiner</b> Jeffrey T. Barton	<b>Art Unit</b> 1795	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 31 March 2008.
- 2a) ☒ This action is **FINAL**.                      2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1-5 is/are pending in the application.
- 4a) Of the above claim(s) 4 and 5 is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-3 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All    b) ☐ Some \*    c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- |  |   |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892)                     | 4) <input type="checkbox"/> Interview Summary (PTO-413)           |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____                                      |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)          | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date _____  | 6) <input type="checkbox"/> Other: _____                          |

## **DETAILED ACTION**

### ***Response to Amendment***

1. The amendment filed on 31 March 2008 does not place the application in condition for allowance.

### ***Status of Objections and Rejections Pending Since the Office Action of 31 December 2007***

2. The objections to the specification and claim 1 are withdrawn due to Applicant's amendment.
3. The rejection of claims 1-3 under 35 U.S.C. §103(a) as unpatentable over Sano et al in view of Kondo is maintained.

### ***Claim Rejections - 35 USC § 103***

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

5. The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.

4. Considering objective evidence present in the application indicating obviousness or nonobviousness.
6. Claims 1-3 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sano et al (JP 11-243218) in view of Kondo. (US 6,103,138)

Regarding claims 1 and 2, Sano et al disclose a stacked photovoltaic element comprising a structure (Figure 1) formed by sequentially arranging a metal layer (101), lower transparent conductive layer (102), first n-type microcrystalline silicon layer (103), first i-type microcrystalline silicon layer (105), first p-type non-single crystal silicon layer (107), a second n-type microcrystalline silicon layer (108), a second i-type microcrystalline silicon layer (110), and a second p-type non-single crystal silicon layer (111) on a support body (100). Sano et al further disclose sequentially laying a third n-type non-single crystal silicon layer (112), a third i-layer of amorphous silicon (113), a third p-type non-single crystal silicon layer (114), and upper transparent conductive layer of ITO (115) on and in contact with the second p-layer. (Figure 1; Paragraphs 0078-0081; 0091-0148)

Sano et al do not explicitly disclose the first and second i-type layers containing phosphorus, such that the content ratio of P:Si of the first i-type layer is greater than that of the second i-type layer.

Kondo et al teaches single and tandem photovoltaic cells formed from p-i-n junctions having microcrystalline i-type layers (Figures 1 and 4; microcrystalline i-type layer 102b; Column 7, lines 23-30), wherein the i-type layer(s) comprise phosphorus at levels of 1 ppm or more, with examples provided at 3 ppm (Table 2; Column 9, lines 29-42) In addition, Kondo et al teach that it is preferred that the phosphorus is unevenly

distributed in the films, with concentration increasing towards the electroconductive substrate 101, which is analogous to the substrate 120 of Figure 1 of Sano et al. This preference is due to the presence of higher grain boundary densities closer to this substrate, allowing the phosphorus atoms to exhibit their favorable effect more efficiently in this region. (Column 4, lines 9-19)

It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the tandem cell of Sano et al by incorporating phosphorus into the i-type microcrystalline layers 105 and 110 at levels of about 3 ppm, as taught by Kondo, because Kondo teaches that providing phosphorus to the layers in this amount allows faster deposition of the cell layers with much less pronounced degradation of photovoltaic properties. (Table 2; Column 9, lines 29-42) The benefits of faster cell production would have been clear to one having ordinary skill in the art.

It would also have been obvious to one having ordinary skill in the art at the time the invention was made to provide a somewhat greater concentration of phosphorus to the first i-type layer (105) than to the second i-type layer (110), because layer 105 lies closer to electroconductive substrate 120 than layer 110, and Kondo teaches that it is preferred to provide a higher phosphorus concentration closer to the electroconductive substrate, because the phosphorus atoms exhibit their favorable effect more efficiently in this region. (Column 4, lines 9-19)

Regarding claim 3, Kondo teaches phosphorus concentrations of at least 1 ppm, with the examples using 3 ppm concentration. (Table 2; Column 9, lines 29-42) Within

the combined cell, it would have been obvious to select phosphorus concentrations corresponding to the levels disclosed in Kondo.

### ***Response to Arguments***

7. Applicant's arguments filed 31 March 2008 have been fully considered but they are not persuasive.

Applicant requested acknowledgment of the foreign priority claim and receipt of the certified copy of the foreign priority document. The Examiner apologizes for this oversight in the previous Office Action. Applicant's foreign priority claim is acknowledged, as is the receipt of a certified copy of JP 2003-085879.

Applicant appears to argue that Kondo is deficient as a secondary reference because Kondo does not disclose multiple subcells having multicrystalline silicon layers. As is pointed out clearly in the rejection, Sano et al is relied upon for teaching this feature. Whether Kondo teaches a tandem cell having the same number of subcells as Sano et al is immaterial to the rejection. Sano teaches all claimed features, except for the presence of phosphorus in the multicrystalline silicon i-type layers. Kondo teaches that providing phosphorus to a multicrystalline i-type layer at levels of 3 ppm allows faster deposition of the cell layer with much less pronounced degradation of photovoltaic properties (Table 2; Column 9, lines 29-42), which provides motivation for providing phosphorus to these layers in Sano et al. Furthermore, Kondo teaches that it is preferred to provide a higher phosphorus concentration closer to the electroconductive substrate, because the phosphorus atoms exhibit their favorable

effect more efficiently in this region (Column 4, lines 9-19), which would have motivated a skilled artisan to provide relatively elevated phosphorus concentration in the regions of the lower multicrystalline i-type layer of Sano et al. All limitations of the claim are therefore met by the combined teachings of the references.

### ***Conclusion***

8. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Dr. Jeffrey T. Barton whose telephone number is (571)272-1307. The examiner can normally be reached on M-F 9:00AM - 5:30PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nam Nguyen can be reached on (571) 272-1342. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Art Unit: 1795

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Kaj K Olsen/  
Primary Examiner, Art Unit 1795

JTB  
8 July 2008